CLAIMS

What is claimed is:

1. A waveguide for use with an antenna aperture for forming a transition region for channeling electromagnetic wave signals, the waveguide comprising:

a tubular waveguide component having a tapering inner surface;

a dielectric member having a predetermined length and a generally conical profile, and inserted at least substantially into the tubular waveguide component to be at least substantially housed therein; and

wherein at least one of said dielectric member and said tapering inner surface comprises a surface that is non-linear.

2. The waveguide for claim 1, wherein the dielectric member is comprised of a plurality of linear sections forming said generally conical profile;

3. The waveguide of claim 1, wherein the tapering inner surface comprises a plurality of adjacently formed linear surface sections.

4. The waveguide of claim 1, wherein the generally conical profile of said dielectric member comprises a gradually curving surface.

5. The waveguide of claim 1, wherein the tapering inner surface of the tubular waveguide component comprises a gradually curving inner surface.

6. The waveguide of claim 1, wherein the dielectric member is disposed concentrically within said tubular waveguide component.

7. The waveguide of claim 1, wherein said dielectric member has a non-linear outer surface and said tubular waveguide component has a non-linear inner surface.

8. The waveguide of claim 1, wherein said tubular waveguide component and said dielectric member are formed having dimensions in accordance with Table 1 herein.

9. A waveguide comprising:

a tubular waveguide member having a tapering inner wall, said tapering inner wall forming a generally linear surface;

a generally conically shaped dielectric member disposed within said tubular waveguide;

wherein said generally conically shaped dielectric member includes an outer surface that is non-linear over a length thereof.

10. The waveguide of claim 9, wherein said outer surface of said dielectric member comprises a plurality of distinct linear sections formed adjacent one another to form said non-linear outer surface.

11. The waveguide of claim 9, wherein said outer surface of said dielectric member comprises a smoothly curving outer surface.

12. A waveguide comprising:

a tubular waveguide member having a tapering inner wall, said tapering inner wall forming a non-linear surface;

a generally conically shaped dielectric member disposed within said tubular waveguide;

wherein said generally conically shaped dielectric member includes an outer surface that is linear over a length thereof.

13. The waveguide of claim 12, wherein said tapering inner wall of said tubular waveguide member comprises a plurality of distinct linear sections forming said non-linear shape.

14. The waveguide of claim 12, wherein tapering inner wall of said tubular waveguide member comprises a smoothly curving surface.

15. The waveguide of claim 12, wherein said dielectric member is disposed concentrically within said tubular waveguide member.

16. An antenna comprising:

an aperture;

a waveguide in electromagnetic wave communication with said aperture;

said waveguide including:

a tubular member having a tapering inner wall surface;

a dielectric insert having an outer surface, and disposed at least substantially within said tubular member; and

wherein at least one of said tapering inner wall surface and said outer surface of said dielectric insert has a non-linear shape over a length thereof.

17. The antenna of claim 16, wherein said tapering inner wall surface of said tubular member comprises a smoothly curving shape.

18. The antenna of claim 17, wherein said outer surface of said dielectric insert comprises a linear surface.

19. The antenna of claim 17, wherein said tapering inner wall surface of said tubular member comprises a plurality of distinct linear sections forming an overall non-linear profile.

20. The antenna of claim 16, wherein said outer surface of said dielectric insert comprises a smoothly curving shape.

21. The antenna of claim 20, wherein said tapering inner wall surface of said tubular member comprises a linear surface.

22. The antenna of claim 16, wherein said outer surface of said dielectric insert comprises a plurality of distinct linear sections to form an overall non-linear, conical shape.

23. The antenna of claim 22, wherein said tapering inner wall surface of said tubular member comprises a linear surface.

24. The antenna of claim 16, wherein said dielectric member has a non-linear outer surface and said inner surface of said tubular waveguide component is non-linear.

25. A method of channeling electromagnetic wave energy comprising:

forming a waveguide by disposing a dielectric insert within a tubular waveguide member; and

forming one of an outer surface of said dielectric insert, and an inner surface of said tubular waveguide member with a non-linear shape.

26. The method of claim 25, further comprising disposing said dielectric insert concentrically within said tubular waveguide member.

27. The method of claim 25, further comprising forming one of said outer surface of said dielectric insert and said inner surface of said tubular waveguide with a gradually curving, conical shape.

28. The method of claim 25, further comprising forming one of said outer surface of said dielectric insert and said inner surface of said tubular waveguide with a plurality of distinct linear sections disposed adjacent one another to form an overall, non-linear surface.

29. A method of channeling electromagnetic wave energy comprising:

forming an annular waveguide channel from a pair of spaced apart surfaces having a cross sectional area that decreases from a first end of said channel to a second end of said channel; and

further forming a first one of said spaced apart surfaces with a non-linear profile and a second one of said spaced apart surfaces with a linear profile.

30. The method of claim 29, further comprising forming said first one of said spaced apart surfaces as a smoothly, gradually curving surface.

31. The method of claim 29, further comprising forming said first one of said spaced apart surfaces with a plurality of distinct linear sections disposed adjacent one another to thus form said non-linear profile.

32. The method of claim 29, further comprising forming said spaced apart surfaces such that one is disposed concentrically relative to the other.

33. The method of claim 29, further forming one of said spaced apart surfaces out of a dielectric material.

34. The method of claim 29, further comprising forming one of said spaced apart surfaces as a conical surface from a dielectric material.

35. The method of claim 29, further comprising forming one of said spaced apart surfaces as a conical surface from a metal.

36. A phased array antenna comprising:

a plurality of apertures; and

a plurality of waveguides in electromagnetic wave communication with said apertures;

wherein each of said waveguides includes:

a tubular member having an tapering inner wall surface; and

a dielectric insert having an outer surface disposed at least substantially within said tubular member; and

wherein at least one of said tapering inner wall surface and said outer surface of said dielectric insert has a non-linear shape over a length thereof.

37. The phased array antenna of claim 36, wherein dimensions of said tubular member and said dielectric member are defined in accordance with Table 1 herein.

38. A waveguide for an antenna system, comprising:

means for defining a cut-off frequency threshold of the waveguide by controlling a geometry of a tubular waveguide component relative to a dielectric insert disposed within the tubular waveguide component.